

# Air Quality in the PAPA

May 2012



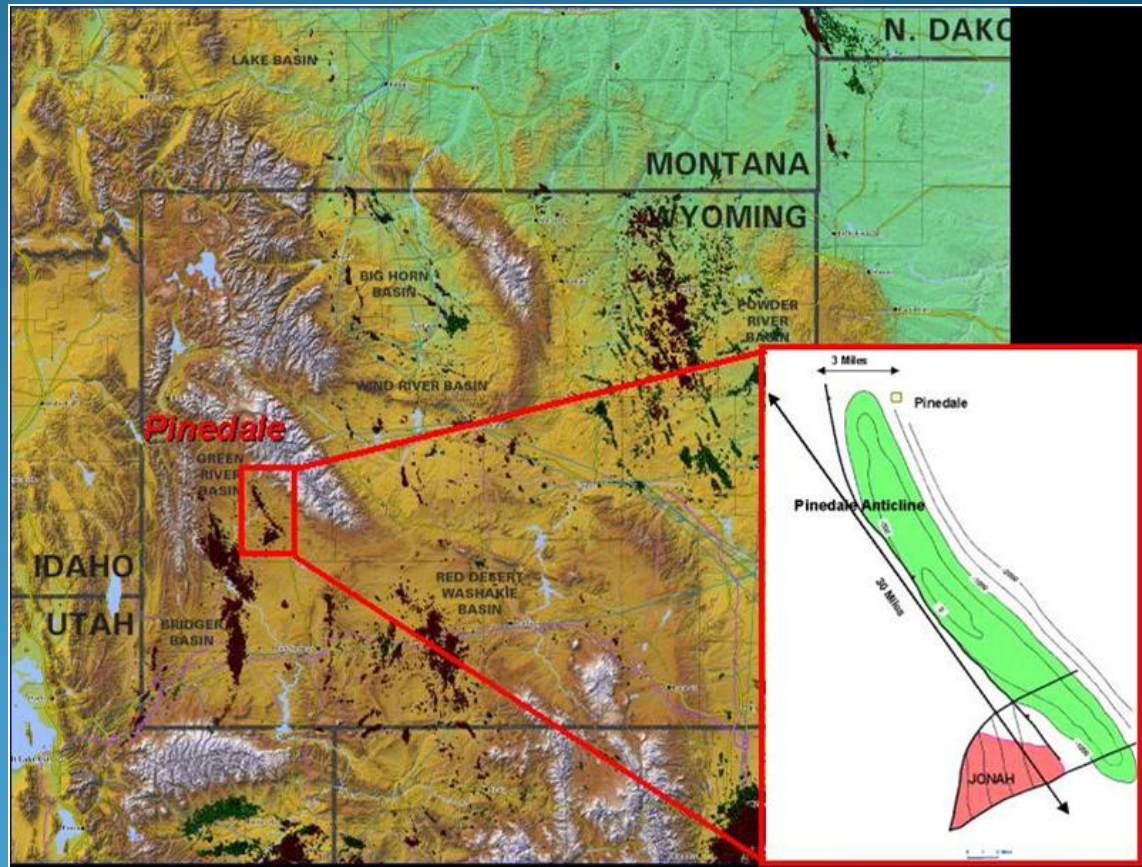


# Agenda

- Background
- Emission Reduction Activities
  - Oxides of Nitrogen (NO<sub>x</sub>)
  - Volatile Organic Compounds (VOC)
- Ozone Contingency Plans
  - Implementation
- Ongoing and Future Emission Reduction

# Air Quality Background

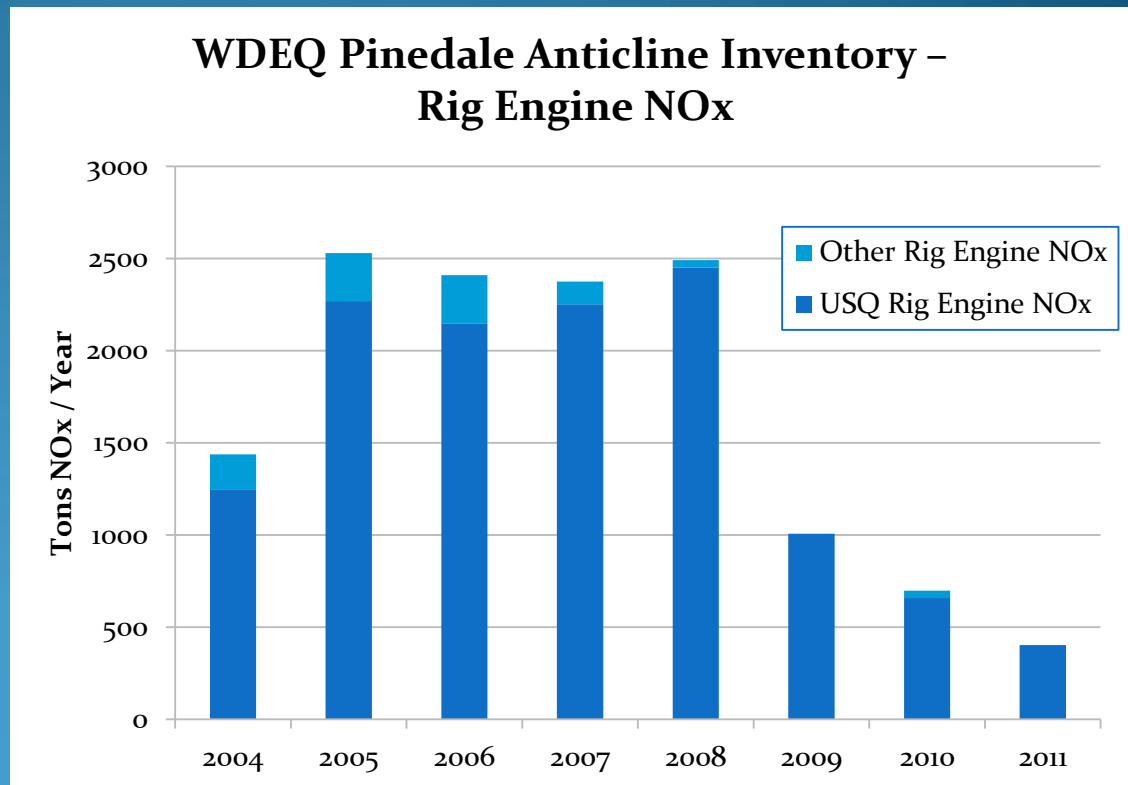
- Upper Green River Basin in SW Wyoming
- A top NG Field in US
- 90% of Acreage is Federal BLM
- Several Adjacent Class I Areas & National Parks
- Pinedale Drilling Activity
  - 2008: 30 Diesel Rigs
  - 2012: 11 Diesel Rigs with SCRs
- Producing Wells
  - 2008: 950
  - 2012: 2,035
- Wells / Rig
  - Past 8 to 10 Wells / Year / Rig
  - Now 20 Wells / Year / Rig



# Air Emission Inventory - NOx

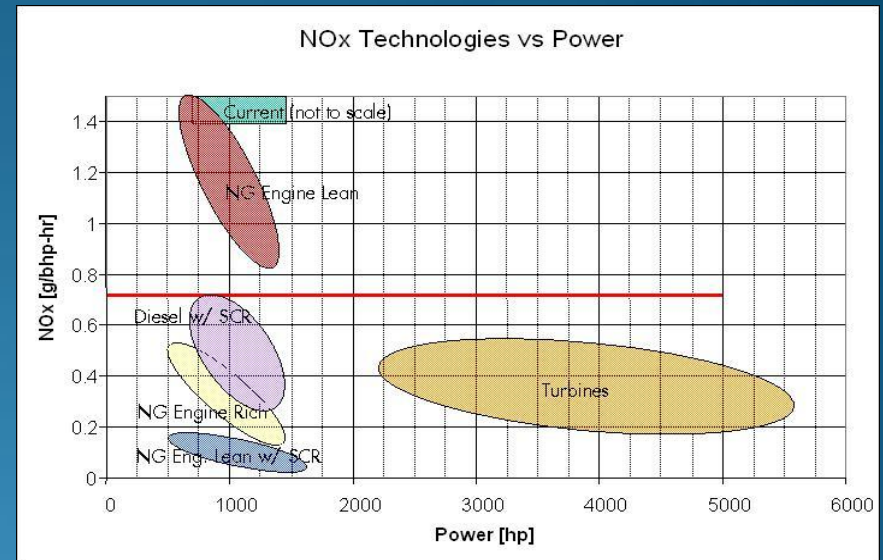
- Nitrogen Oxides (NOx)
  - Combustion
- Sources
  - Drilling Rigs
  - Compression
  - Engines
    - Stationary
    - Mobile
  - Production Burners
  - Control Devices
- Impacts
  - Visibility
  - Precursor for Ozone

**85% NOx Reduction**



# Emission Reduction Activities – NO<sub>x</sub>

- Drill Rig Engine Emissions
  - Newer / Lower Emission Engines
    - All EPA Tier 1 or Tier 2
  - Catalyst Technologies
    - **S**elective **C**atalyst **R**eduction
      - Uses Liquid Fertilizer
      - Greater 90% Removal of NO<sub>x</sub>
      - Minimal Operational Issues
      - 31% Usage on Rig Engines March 2011
      - 100% Usage on Rig Engines Dec 2011
- Electrification of natural gas engines
- Progress to Achieve Regulatory Commitments
  - 2005 NO<sub>x</sub> Levels (Completed)
  - 80% NO<sub>x</sub> Reduction Rig Emissions (Completed)
  - Goal of Zero Days Visibility Impact
- Reduced Air Quality Impacts
  - Ozone, Visibility





# Air Emission Inventory - VOC

- Volatile Organic Compounds (VOC)

- Gas Production and Liquids Storage / Handling

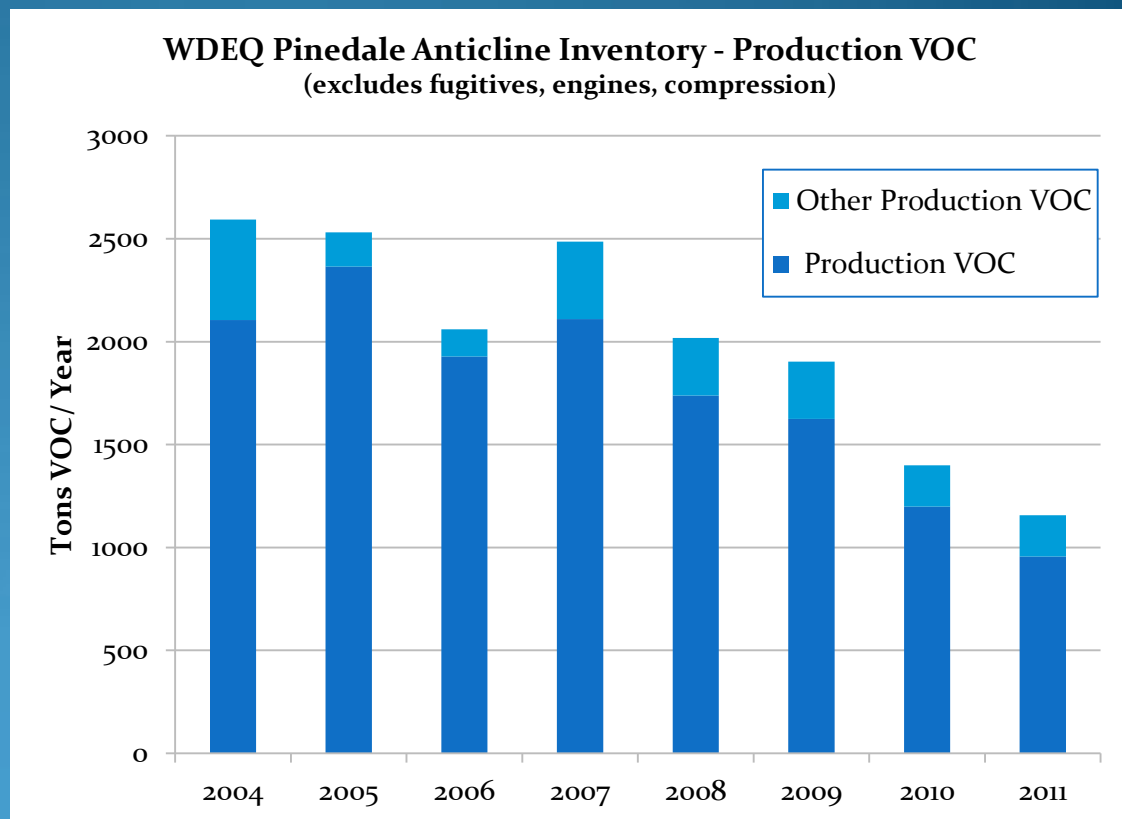
- Sources

- Dehydration
- Condensate Storage
- Truck Liquids Loading
- Fugitive
- Compression
- Engines
  - Stationary

- Impacts

- Precursor for Ozone
- Health – Air Toxics

**45% VOC Reduction**



# Emission Reduction Activities – VOC

- WDEQ Best Available Control Technology (WDEQ Required)
  - Storage Tanks
  - Dehydration
  - Pneumatic Pumps / Controls
  - Engines
  - Emission Testing
- Voluntary Efforts
  - Grandfathered Locations
- Fugitive Emissions
  - Infrared Camera Inspections
- Liquids Gathering System
  - Storage Tanks
  - Liquids Loading
  - Fugitives



# Ozone Contingency Plans

Ozone Forecasting /  
Advisory

Implement Required  
Plans

Short Term Emission  
Reductions

Awareness Training

Inspection & Maintenance

Notification System

Short Term Control Measures

- Standby / Shutdown of Well Completion Operations
- Shutdown Construction
- Reschedule Maintenance Activities

Report Measures Taken to WDEQ



# Ongoing & Future Emissions Reduction

- Reviewing Operations for Additional Emission Reduction Measures
- New WDEQ BACT Requirements
  - Venting / Blowdown Permits
  - Other Concentrated Development Areas
- Participation in WDEQ Upper Green River Basin Air Quality Citizen's Advisory Task Force
- Fugitive Leak Surveys at Facilities
- Complete d Installation of SCR NO<sub>x</sub> Technology
  - Dec 2011 100% of Drill Rig Engines
- Looking at Catalyst Technology Options for Frac Engines
- Convert Natural Gas Engines Where Electricity is Available
- Reconvene Operator BMP Workgroup

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